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Regarding
Global Climate Change

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Mr. Chairman and members of the Subcommittee, thank you for inviting me today to discuss climate change and wildfire. I am the Deputy Chief of State and Private Forestry for the Forest Service. Part of my responsibility as Deputy Chief includes leadership of the Forest Service Fire and Aviation Management program. Today I am accompanied by Dr. Susan Conard, our scientist who leads the fire ecology program in Forest Service Research and Development.

It is entirely appropriate to include the Forest Service in today's hearing on global climate change. Studying the changing environment is an important challenge that the Forest Service is addressing. The Forest Service has compiled nearly two decades of focused climate research, several decades of air pollution research, and several decades of integrated assessments that provide a firm scientific foundation for addressing the challenges of forest and rangeland management relative to climate change.

The Forest Inventory and Analysis Program and more recent Forest Health Monitoring Program, for example, have tracked the status and changes of vegetation on public and private lands for more than 75 years. The nation-wide network of experimental forests and ranges provides up to 100 years of data on climate and hydrology. Further scientific support comes from partnerships with universities, federal and state agencies, non-governmental organizations, and the forest industry. Scientists and managers are using this information and working together to adapt to our changing forests and rangelands.

Forest Service Research and Development continues to study the interactions between fire and climate, factors affecting fire behavior and the potential effects of changing climate on fire patterns and vegetation. New research is addressing interactions between insect mortality and fire behavior. Forest Service Research and Development is working to develop improved projections of the impacts of potential climate changes and methods to help us adapt to and mitigate those changes, including developing an improved model to project the effects of climate change on future fire patterns in North America.

USDA agencies, including the Forest Service are active in the United States Climate Change Science Program (CCSP). USDA is the lead for a CCSP Synthesis and Assessment Report on the Impacts of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity that is expected to be completed in December of 2007. A primary goal of the report is to enhance our understanding and ability to estimate impacts of future climate change on these systems and resources in the United

States. This report is being prepared by the Department's Global Change Program Office with significant contributions from the Forest Service.

What We Know

Two recent reports from the Intergovernmental Panel on Climate Change highlight the impacts of climate change on forests and rangelands. These impacts include changes in precipitation, changes in water availability, plant responses to increased CO2 concentrations in the atmosphere, shifts in plant and animal distribution, as well as longer, warmer growing seasons. The IPCC concluded for North America that disturbances from pests, diseases, and fire are projected to have increasing impacts on forests, with an extended period of high fire risk and large increases in area burned.

Forest management history and climate factors both play roles in influencing the frequency, intensity, and distribution of U.S. wildfires. Increasing temperatures and shifting precipitation lead to increased tree stress and in turn can influence mortality from insects and disease. Those conditions lead to increased fire hazard. Fuels treatments and active forest management have reduced fire hazard and mitigated these increases in fire hazard.

Measures of drought stress have been particularly acute in the Northern Rockies and Northern California during summers of this time period. Not coincidentally, these regions have accounted for a large majority of increased wildfire frequency in the U.S.

Recent changes in fire regimes signal two kinds of climate change. There is a cycle of natural variability in drought and temperature that results largely from oscillations in ocean circulation patterns. Historic data over the past century, as well as the results of global climate models, also strongly support the occurrence of progressive climate change. This change is resulting in warming temperatures over most of the United States.

Even with active restoration management at the landscape scale, large and severe forest and rangeland wildfires are more likely under dry conditions. One factor in the recent increase in wildfire occurrence is a strong interdecadal increase in climatic variability resulting from changes in oceanic circulation patterns such as El Niño. The wet years of climatic cycles lead to high rates of vegetative growth, often in the forest understory. During cyclic dry years with warm winters, pest outbreaks can cause forest diebacks to occur with increasing standing dead biomass. During such dry cycles, drought can often stress trees and other vegetation with resulting higher flammability of live fuels. Additionally, alpine snow pack may be reduced and the timing of runoff altered, creating larger water deficits during the fire season.

Drought

Scientists tell us the magnitude and effects of climate change are likely to vary in different regions of North America. Many areas of the United States have warmed over the past 40 years, with the greatest changes occurring in northern latitudes and in the

western United States, where increases in temperature will result in earlier snowmelt and increased evaporation.

These changes are expected to lead to longer summer drought and overall changes in water timing and supply, resulting in increased vegetation stress and mortality from insects and diseases, which in some cases can increase susceptibility of a forest to wildfire. Several research studies have shown correlations between the size and intensity of wildfires and the extent and severity of drought, the timing of snowmelt and changes in the length of the fire season. In many parts of the United States, forest health has decreased due to increased stand densities and fire suppression. Active management of forests, as encouraged under the Healthy Forest Initiative and Healthy Forest Restoration Act, can mitigate the effects of climate change. The size and intensity of wildfires can be limited by reducing stand density and treating fuel buildup.

Insects

Destructive native insect populations in the western United States, Alaska, and Canada are increasing to unprecedented densities, partly as a result of changing climate extremes. Warming climate alters or expands the area over which a pest can survive and reproduce. Longer, warmer growing seasons permit more annual insect generations and warmer winters allow insects to expand upward in elevation and far north of their historic ranges. Increasing temperature and drought stress also reduces trees' resistance to insect attacks, which leads to increased insect populations. Tree species and forest ecosystems will

take decades to centuries to redistribute, while some invasive insect pests and annual plants can become quickly established in distant new regions.

In recent years, insect outbreaks have caused unusually high levels of tree mortality in many areas. Spruce forests on the Kenai Peninsula of Alaska and ponderosa pine forests in the San Bernardino Mountains of California have been hard hit by bark beetles. Drought and bark beetles have killed 15-30% of the pinyon pine on nearly 4 million acres of the southwest. Insects, combined with drought stress, killed most of pines that died in the recent western drought.

The mountain pine beetle has decimated forests as far north as British Columbia, as its low temperature limit has moved north, and has moved on to attack high elevation species such as whitebark pine. It is feared western bark beetles will circumvent the natural barrier of the Great Plains by crossing Canada's jack pine forests and reach our pine forests in the Lake states.

Actions

As the wildfire situation grows more complex and challenging, due to expanding wildland urban interface, increasing hazardous fuels and changing climate, firefighting organizations are adapting their strategies and tactics by increasing flexibility and mobility. Since the inception of the National Fire Plan, nearly 20 million acres of fuels reduction has been completed with Federal funding. Many of these projects have significantly reduced the impact of subsequent wildfires. Through the use of wildfire

threat mapping and decision support tools, funding to address fire suppression and fuels reduction is being directed to areas where it can be most effective at reducing wildfire threats to communities and natural resources.

Further Research

While we have some knowledge of ecosystems and the climate change effects that are now underway and are expected, there are gaps about vegetation and landscape management under increasing climate stress. Understanding potential effects of climate change on vegetation and landscape management may assist managers to better predict and plan for potential changes in fire regimes and fire effects.

Information on the possible responses of ecosystems and individual plant and animal species can help develop strategies to maintain plant and animal viability. Basic research can help provide base strategies to manage impacts to biodiversity, water supplies and forest health. We are limited by gaps in information about the timing, scale, and location of climate change impacts. Climate models lack the ability to provide projections at a detailed scale that is most useful to land managers and local and regional planners.

Conclusion

In the future, we expect that changing climate will lead to shifts in vegetation and species distribution and disturbance patterns. We will need to adapt our fire management and forest and range management programs to anticipate the effects of climate changes and mitigate the potential impacts. The Forest Service is focusing on improving forest health and resilience of ecosystems to climate change by managing forests to reduce fuels and

achieve healthy conditions. Federal, state and local managers are working together to increase community preparedness and to reduce fuel hazard and the likelihood of uncharacteristically severe fires and insect infestations. Many of the approaches we are using to reduce fire risk and restore fire-affected systems may also increase the resilience of America's forests to changing climate. Through active management, we are trying to increase the health, resiliency and productivity of fire-affected ecosystems across the United States.

Thank you for the opportunity to discuss these issues with the Subcommittee. Dr. Conard and I would be happy to answer any questions that you have.